

Research Note

Helminths of the Red-spotted Toad, *Bufo punctatus* (Anura: Bufonidae), from Southern Arizona

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ABSTRACT: The gastrointestinal tracts and lungs of 21 *Bufo punctatus* were examined for helminths. The cestode *Distoichometra bufonis* Dickey, 1921, and the nematodes *Aplectana itzocanensis* Bravo H., 1943, and *Oswaldocruzia pipiens* Walton, 1929, were present. *Aplectana itzocanensis* had the greatest prevalence (29%) and highest mean intensity (12). Our findings represent new host records.

KEY WORDS: Cestoda, *Distoichometra bufonis*, Nematoda, *Aplectana itzocanensis*, *Oswaldocruzia pipiens*, Bufonidae, *Bufo punctatus*, prevalence, intensity, survey.

The red-spotted toad, *Bufo punctatus* Baird and Girard, 1852, a toad of desert streams as well as canyonlands, ranges from southeastern California, southern Nevada, Utah, Colorado, southwestern Kansas, western Oklahoma, and central Texas to Hidalgo, Mexico and the tip of Baja California; it is found from below sea level (Death Valley, California) to 1,980 m (Stebbins, 1985). To our knowledge, there are no reports on the helminth fauna of *B. punctatus*. The purpose of this note is to describe the prevalence and intensity of the helminth fauna of a population of *B. punctatus* from southern Arizona.

Twenty-one *B. punctatus* (mean snout–vent length, SVL = 50.1 mm \pm 10.0 SD (range 36–68 mm SVL) were hand collected and fixed in 10% formalin. The abdominal wall was slit to allow rapid penetration of fixative into the internal organs. Specimens were deposited in the herpetology collection of the Los Angeles County Natural History Museum (LACM). Six were collected July 1989 (LACM 138664–138669) from Gates Pass, Tucson Mountains, Pima County, Arizona (32°13'N, 111°06'W, 966 m elevation), 1 was collected August 1990 (LACM 138670) from Tucson, Pima County, Arizona (32°20'N, 111°02'W, 688 m elevation), and 14 were collected September 1990 (LACM 138671–138684) from Lukeville, Pima County, Arizona (31°53'N, 112°48'W, 424 m elevation). The body cavity was opened by a longitudinal incision from throat

to vent and the gastrointestinal tract was excised by cutting across the anterior esophagus and the rectum. The lungs, but not the urinary bladder, were also removed for examination. The esophagus, stomach, small intestine, large intestine, and lungs were examined separately. Each helminth was removed and identified utilizing a glycerol wet mount. Representative cestodes were stained with hematoxylin and mounted in balsam. Selected intact specimens were placed in vials of alcohol and deposited in the USNM Helminthological Collection, USDA, Beltsville, Maryland 20705: *Distoichometra bufonis* (80802), *Aplectana itzocanensis* (80803), and *Oswaldocruzia pipiens* (80804).

No helminths were recovered from the esophagus or lungs. Prevalence, location, and mean intensity of recovered helminths are given in Table 1. There were 3 (23%, 3/13) infected female toads and 6 (75%, 6/8) infected male toads in the survey sample. Five of 6 toads infected with *A. itzocanensis* were males, all toads infected with *D. bufonis* were females, and a single female toad harbored *O. pipiens*. Only 1 toad had a mixed helminth infection.

The prevalence and mean intensity for *D. bufonis* reported here (14, 2, respectively) are lower than previously reported. Hardin and Janovy (1988) found prevalences of 70–100% and mean intensities of 2.7–14.8 in populations of *B. woodhousii* from Nebraska. Goldberg and Bursey (1991) reported prevalences of 19% (mean intensity 4) and 20% (mean intensity 3), respectively, from populations of *Bufo cognatus* and *Scaphiopus couchii*. It should be noted that the population of *B. punctatus* examined in this study is sympatric with the populations of *B. cognatus* and *S. couchii* examined by Goldberg and Bursey (1991). *Distoichometra bufonis* has also been reported from *Bufo terrestris*, *Bufo woodhousii fowleri*, and *Scaphiopus* sp. by Douglas (1958) and from *Bufo debilis debilis* and *Bufo woodhousii*

Table 1. Prevalence (%), mean intensity (range), and location of helminths from 21 *Bufo punctatus*.

Parasite	Prevalence	Mean intensity (range)	Location*
Cestoidea			
<i>Distoichometra bufonis</i>	14	2 (1-4)	b
Nematoda			
<i>Aplectana itzacanensis</i>	29	12 (4-33)	b, c
<i>Oswaldocruzia pipiens</i>	5	2 (2)	a

* a = stomach, b = small intestine, c = large intestine.

woodhousii by McAllister et al. (1989). It was originally described from *Bufo terrestris* (= *lentiginosus*) by Dickey (1921). Cyclophyllidean cestodes are acquired through infected invertebrate intermediate hosts (Schmidt, 1986).

Of the parasites recovered in this study, *Aplectana itzacanensis* had the greatest prevalence (29%) and highest mean intensity (12). It was first described by Bravo H. (1943) in *Scaphiopus multiplicatus* from Puebla, Mexico, and was subsequently redescribed from *Bufo woodhousii* by Baker (1985). *Aplectana itzacanensis* has been found in *Bufo marinus* from Costa Rica (Brenes and Bravo Hollis, 1959) and Veracruz, Mexico (Caballero Deloya, 1974), and in *Bufo alvarius* and *Bufo cognatus* from southern Arizona (Goldberg and Bursey, 1991). Although the life history of *A. itzacanensis* apparently has not been studied, Chabaud and Brygoo (1958) studied a species of *Aplectana* and reported that the life cycle has 2 phases: a preinfection, free-living phase (hatching stage to third-stage larvae) and a parasitic stage (infective third-stage larvae that become parasitic in the intestine of adult amphibians). Thus, infection in adult toads is acquired when larvae are swallowed by tadpoles and retained through metamorphosis or when larvae are accidentally swallowed by adult toads.

Oswaldocruzia pipiens has been found frequently in North American amphibians (see Baker, 1987). Among the toads, it has been reported in *B. woodhousii fowleri* by Brandt (1936), Rankin (1945), and Campbell (1968); in *Bufo americanus* by Ashton and Rabalais (1978); in *Bufo terrestris*, *Bufo valliceps*, and *Bufo houstonensis* by Thomas et al. (1984); in *B. alvarius* and *B. cognatus* by Goldberg and Bursey (1991); in *Schaphiopus holbrooki* by Brandt (1936); and in *S. couchii* by Goldberg and Bursey (1991). The life cycle of *O. pipiens* has been studied by Baker

(1978) who reported that the life cycle has 2 phases: a preinfection, free-living phase and a parasitic stage. Infection of adult toads is gained by penetration through the skin by 3rd stage larvae.

None of the parasites found in this study is unique to *Bufo punctatus*, but each represents a new host record. Based upon data from Baker (1987), McAllister et al. (1989), and Goldberg and Bursey (1991), we calculated an average of 4.1 (± 5.2 SD) species of nematodes (range 1-22) from 56 species of the family Bufonidae. Thus, the number of nematode species recovered in this study falls within the range that might be expected. Whether the differential gender infection rates reported here are an artifact of sampling or a reflection of microhabitat differences remains to be determined.

The population of *B. punctatus* examined in this study is sympatric with the populations of *B. alvarius*, *B. cognatus*, and *S. couchii* studied by Goldberg and Bursey (1991). Thus, it is not unexpected that these populations should share some of the same helminth species. However, we have no explanation for the apparent cestode substitution that occurs (*Nematotaenia dispar* in *B. alvarius* and *Distoichometra bufonis* in *B. punctatus*, *B. cognatus*, and *S. couchii*), nor can we explain the occurrence of *Aplectana itzacanensis* in *B. punctatus*, *B. alvarius*, and *B. cognatus*, and its replacement by *A. incerta* in *S. couchii*.

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Literature Cited

- Ashton, A. D., and F. C. Rabalais. 1978. Helminth parasites of some anurans of northwestern Ohio. Proceedings of the Helminthological Society of Washington 45:141-142.
- Baker, M. R. 1978. Development and transmission of *Oswaldocruzia pipiens* Walton 1929 (Nematoda: Trichostrongylidae) in amphibians. Canadian Journal of Zoology 56:1026-1031.
- . 1985. Redescription of *Aplectana itzacanensis* and *A. incerta* (Nematoda: Cosmoceridae) from amphibians. Transactions of the American Microscopical Society 104:272-277.
- . 1987. Synopsis of the Nematoda parasitic in amphibians and reptiles. Memorial University of Newfoundland, Occasional Papers in Biology 11: 1-325.
- Brandt, B. B. 1936. Parasites of certain North Carolina Salientia. Ecological Monographs 6:491-532.
- Bravo H., M. 1943. Dos nuevos nemátodos parásitos

- de anuros del sur de Puebla. *Anales del Instituto de Biología, Universidad Nacional de México* 14: 69–79.
- Brenes, R. R., and M. Bravo Hollis.** 1959. Helminths of the República de Costa Rica. VIII. Nematoda 2. Algunos nemátodos de *Bufo marinus marinus* (L.) y algunas consideraciones sobre los géneros *Oxysomatium* y *Aplectana*. *Revista de Biología Tropical* 7:35–55.
- Caballero Deloya, J.** 1974. Estudio helmintológico de los animales silvestres de la estación de biología tropical “Los Tuxtlas,” Veracruz. Nematoda I. Algunos nemátodos parásitos de *Bufo horribilis* Wiegmann, 1833. *Anales del Instituto de Biología, Universidad Nacional de México* 45:45–50.
- Campbell, R. A.** 1968. A comparative study of the parasites of certain Salientia from Pocahontas State Park, Virginia. *Virginia Journal of Science* 19:13–20.
- Chabaud, A. G., and E. R. Brygoo.** 1958. Description et cycle évolutif d'*Aplectana courdurieri* n. sp. (Nematoda, Cosmocercidae). *Mémoires Institut des Sciences, Madagascar* 12:159–176.
- Dickey, L. B.** 1921. A new amphibian cestode. *Journal of Parasitology* 7:129–136.
- Douglas, L. T.** 1958. The taxonomy of nematotaeniid cestodes. *Journal of Parasitology* 44:261–273.
- Goldberg, S. R., and C. R. Bursey.** 1991. Helminths of three toads, *Bufo alvarius*, *Bufo cognatus* (Bufonidae), and *Scaphiopus couchii* (Pelobatidae), from southern Arizona. *Journal of the Helminthological Society of Washington* 58:142–146.
- Hardin, E. L., and J. Janovy, Jr.** 1988. Population dynamics of *Distoichometra bufonis* (Cestoda: Nematotaeniidae) in *Bufo woodhousii*. *Journal of Parasitology* 74:360–365.
- McAllister, C. T., S. J. Upton, and D. B. Conn.** 1989. A comparative study of endoparasites in three species of sympatric *Bufo* (Anura: Bufonidae), from Texas. *Proceedings of the Helminthological Society of Washington* 56:162–167.
- Rankin, J. S.** 1945. An ecological study of the helminth parasites of amphibians and reptiles of western Massachusetts and vicinity. *Journal of Parasitology* 31:142–150.
- Schmidt, G. D.** 1986. *Handbook of Tapeworm Identification*. CRC Press, Boca Raton, Florida. 675 pp.
- Stebbins, R. C.** 1985. *A Field Guide to Western Reptiles and Amphibians*. Houghton Mifflin Company, Boston. 336 pp.
- Thomas, R. A., S. A. Nadler, and W. L. Jagers.** 1984. Helminth parasites of the endangered Houston toad, *Bufo houstonensis* Sanders 1953 (Amphibia, Bufonidae). *Journal of Parasitology* 70:1012–1013.